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This document presents in schematic form a systems approach for the development of an executive information system. Although it does not use the traditional sentence and paragraph form, its diagrams, written in a sequence similar to computer programs, cover such topics as history of information systems, requirements analysis, how to begin building the system, organizational context, system goals, output tracing, data collection, system design and planning, and operational use and improvement. Some discussion of the usefulness of electronic data processing and hardware acquisition is provided. (TT)

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OPERATION PEP/EXECUTIVE INFORMATION SYSTEMS M68-11

A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT OF AN EXECUTIVE INFORMATION SYSTEM

by

J. A. Evans

June 1968

This paper has been especially prepared for distribution to the California Educational Administrators participating in the "Executive Information Systems" Unit of Instruction as part of the instructional program of OPERATION PEP (Prepare Educational Planners)

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EA 002 162

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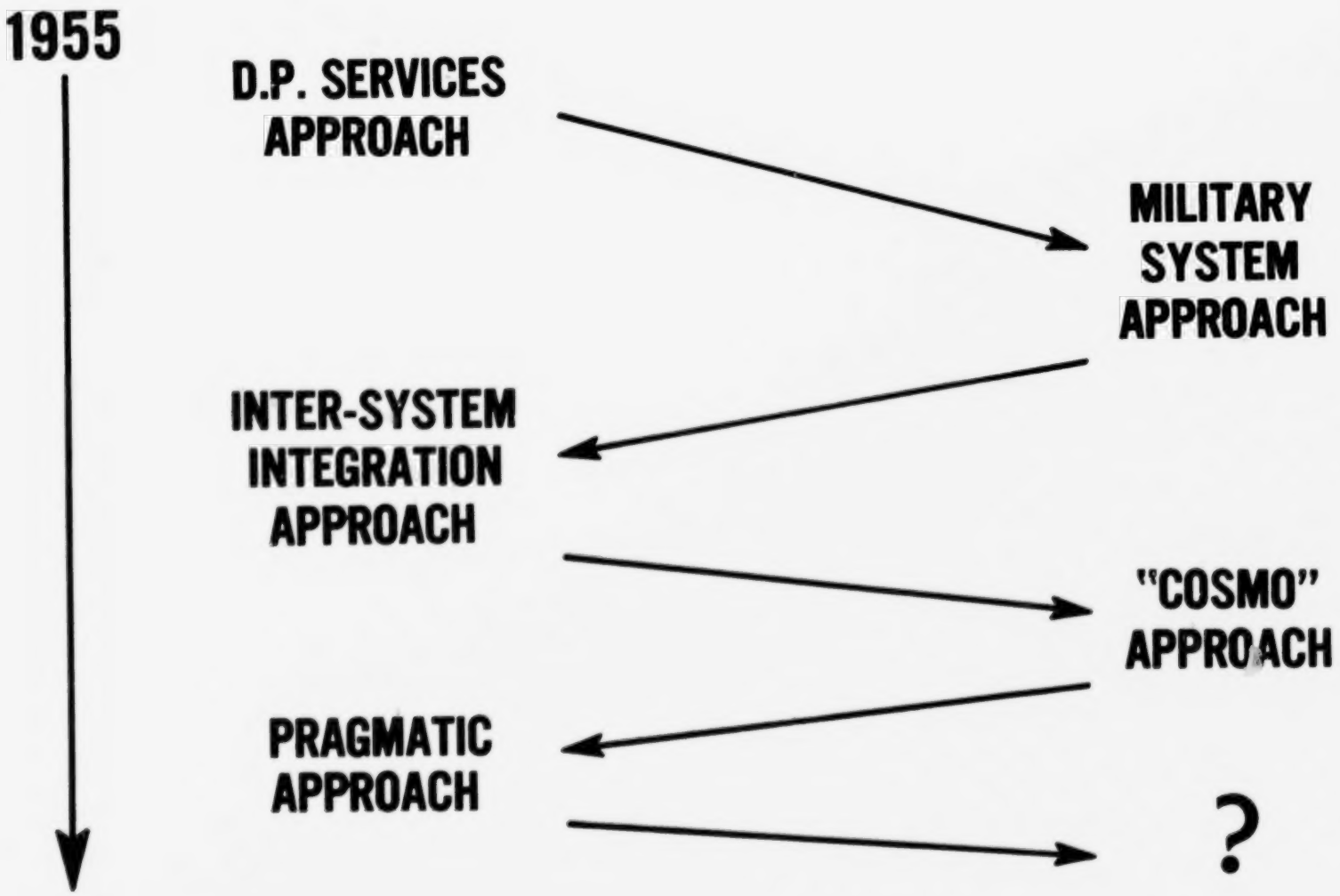
EXECUTIVE INFORMATION SYSTEMS	A PAGE OF HISTORY



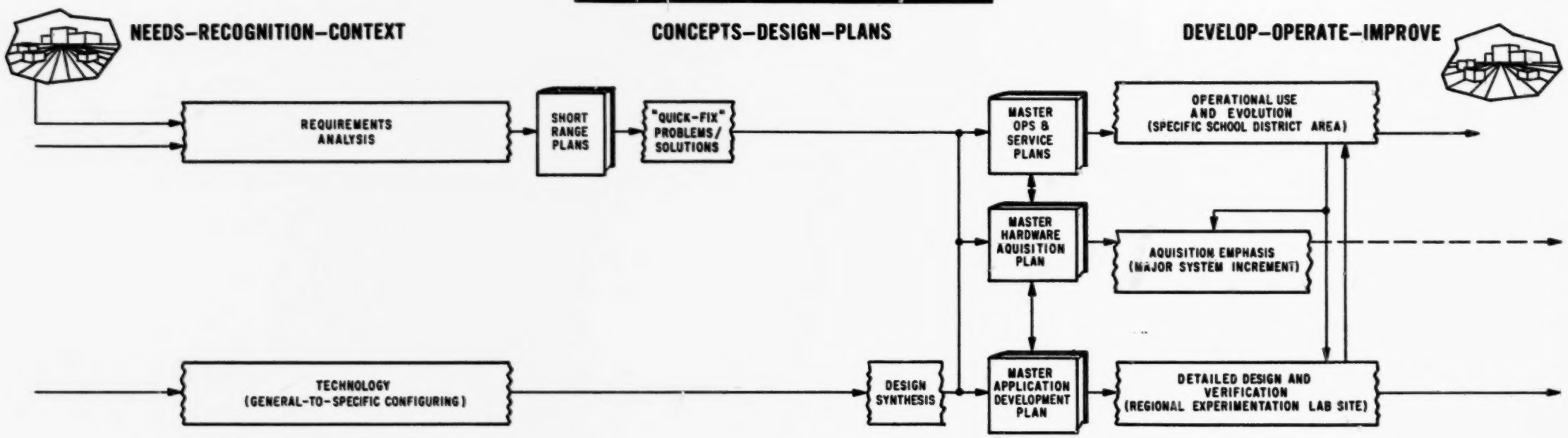
A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT OF EXECUTIVE INFORMATION SYSTEMS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

CONTENTS

- GENERAL FRAMEWORK
- BASIC TYPES OF EFFORT
  1. REQUIREMENTS ANALYSIS
  2. SYSTEM DESIGN & PLANNING
  3. DEVELOPMENT, TEST & EVALUATION
  4. HARDWARE ACQUISITION
  5. OPERATIONAL USE & IMPROVEMENT

EIS ANALYSIS AND DESIGN PROCESS



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

REQUIREMENTS ANALYSIS

- CONSTRAINTS AND FOCUS
  STEPS 1,2

- OPERATIONAL ENVIRONMENT & MISSION
  STEPS 3,4

- FUNCTIONAL ANALYSIS
  STEPS 5,6,7

- SPECIFICATION PRODUCTS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

REQUIREMENTS ANALYSIS - STEP 1

KNOW THE CONSTRAINTS

- LOCUS OF INITIATIVE
- MANAGEMENT VIEW OF PROBLEMS
- TIME AND LEVEL OF EFFORT
- TYPE AND EXTENT OF COOPERATION
- EXISTING SYSTEMS
- LONG-RANGE/SHORT RANGE BIAS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

HOW TO BEGIN

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

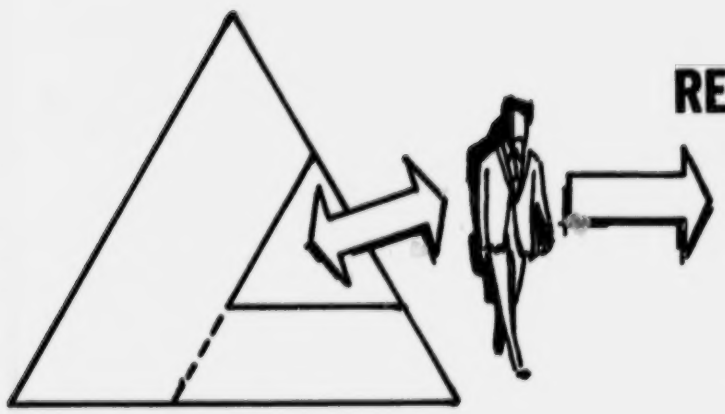
REQUIREMENTS ANALYSIS - STEP 2

SET ORGANIZATIONAL LEVEL FOCUS

- SELECT LEVEL
- IDENTIFY KEY ELEMENTS
- ASCERTAIN KEY ACTIVITIES

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

WHERE TO START



RESPONSIBILITIES

PROBLEMS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

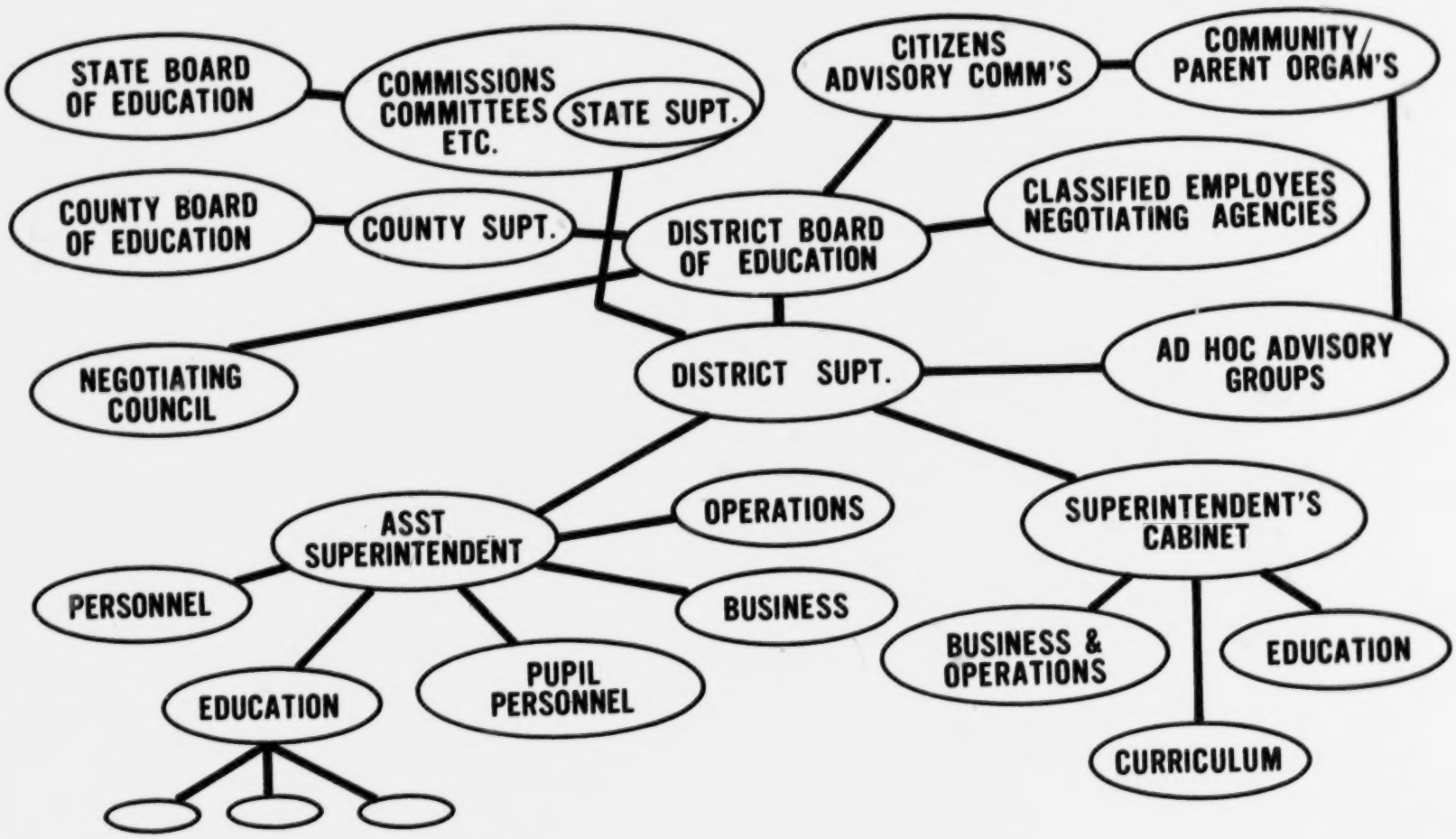
REQUIREMENTS ANALYSIS - STEP 3

LEARN THE OPERATIONAL ENVIRONMENT

- ORGANIZATIONAL CONTEXT
- TASK-RESPONSIBILITY ALIGNMENTS
- MAJOR PROCESSES & DECISIONS
- EXTERNAL CONTEXT
- CORRELATE : CONTEXT-ELEMENTS-ACTIVITIES

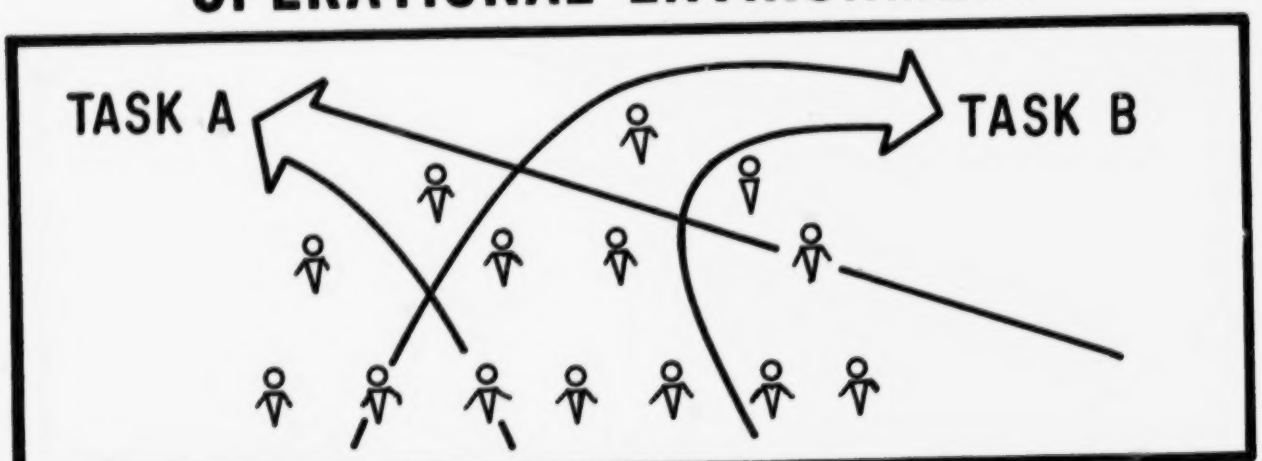
EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

ORGANIZATIONAL CONTEXT



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

OPERATIONAL ENVIRONMENT



RESPONSIBILITY-ORGANIZATION MATRICES

TASK	ORG			
	1	2	3	4
	OK	DK	AD	AA

PROCESS FLOW CRARTS

PROCESS	ORG			
	1	2	3	4

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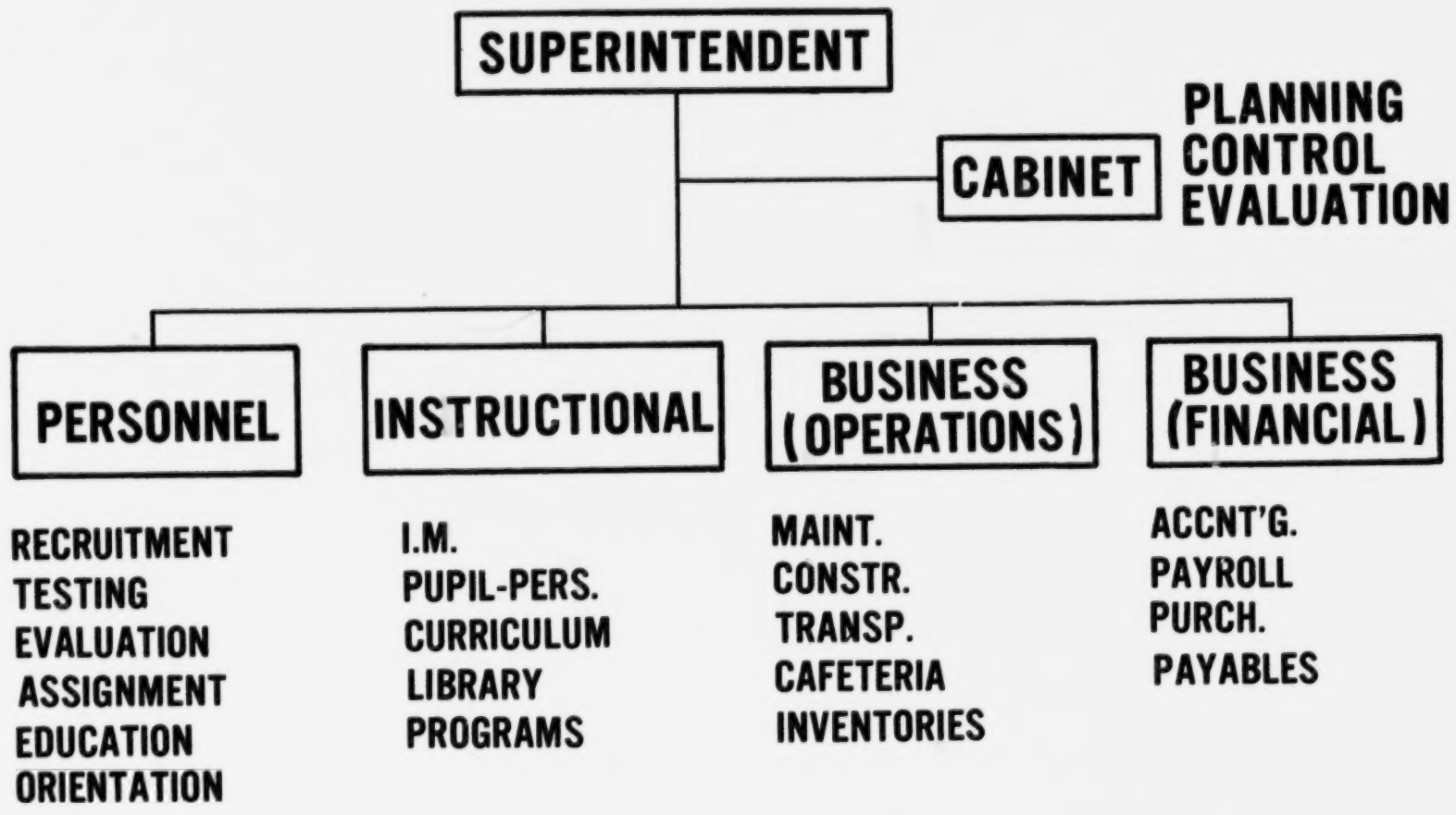


EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

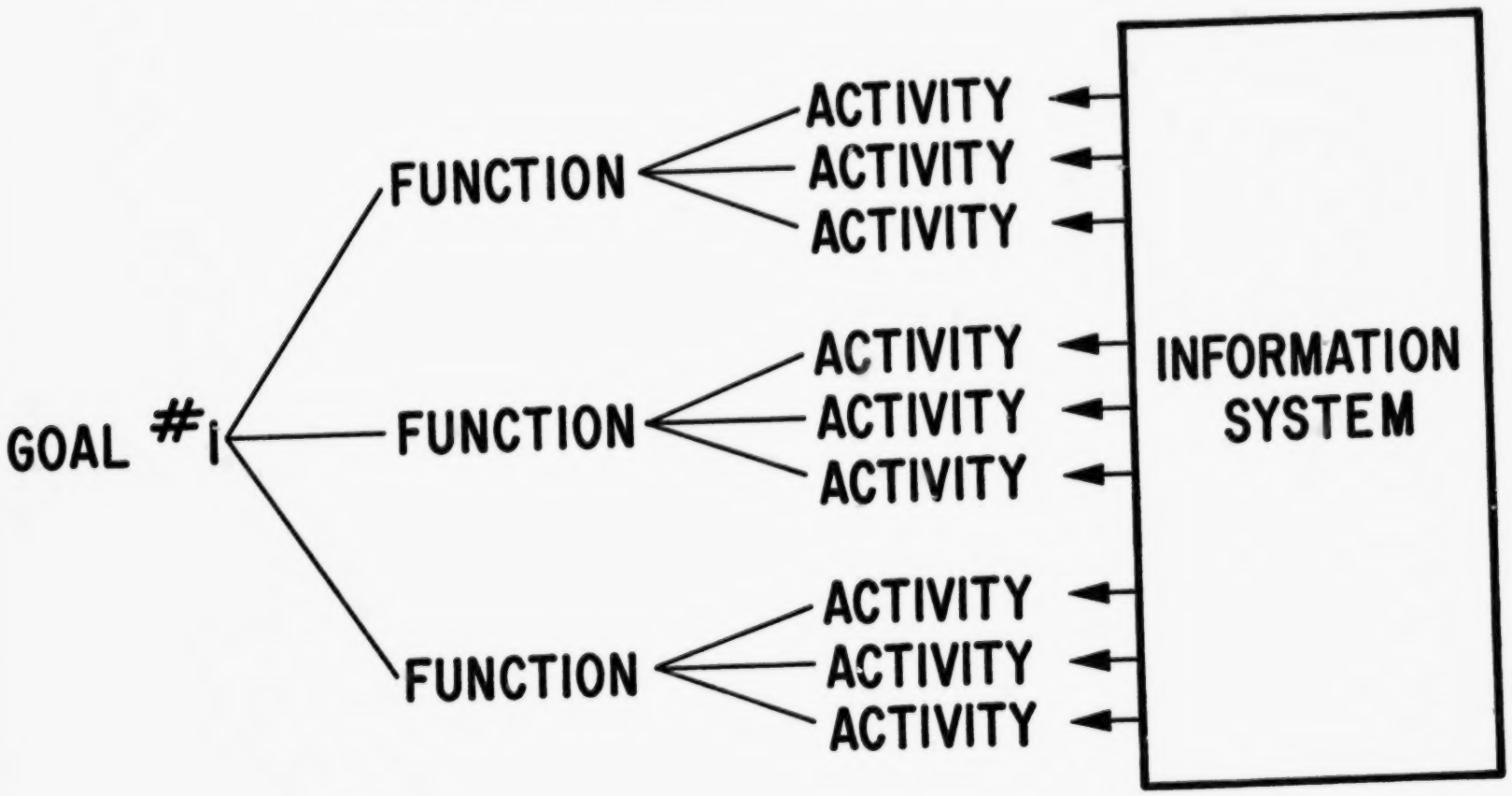
REQUIREMENTS ANALYSIS - STEP 4

PERFORM "MISSION" ANALYSIS

- "ULTIMATE" GOALS
- DEFINABLE OBJECTIVES
- INTERRELATIONSHIPS AMONG OBJECTIVES
  - PRIORITIES
  - HIERARCHIES
- CORRELATE: OBJECTIVES-ORGANIZATION-ACTIVITIES

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

GOALS-FUNCTIONS-ACTIVITIES



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

SYSTEM ANALYST'S DILEMMA

REAL-WORLD GOALS	GOALS FOR DESIGN GUIDANCE
MULTIPLE COMPLEX UNDEFINED CONTROVERSIAL	SIMPLE CLEARLY RELATED PRECISELY DEFINED NON-CONTROVERSIAL

?

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

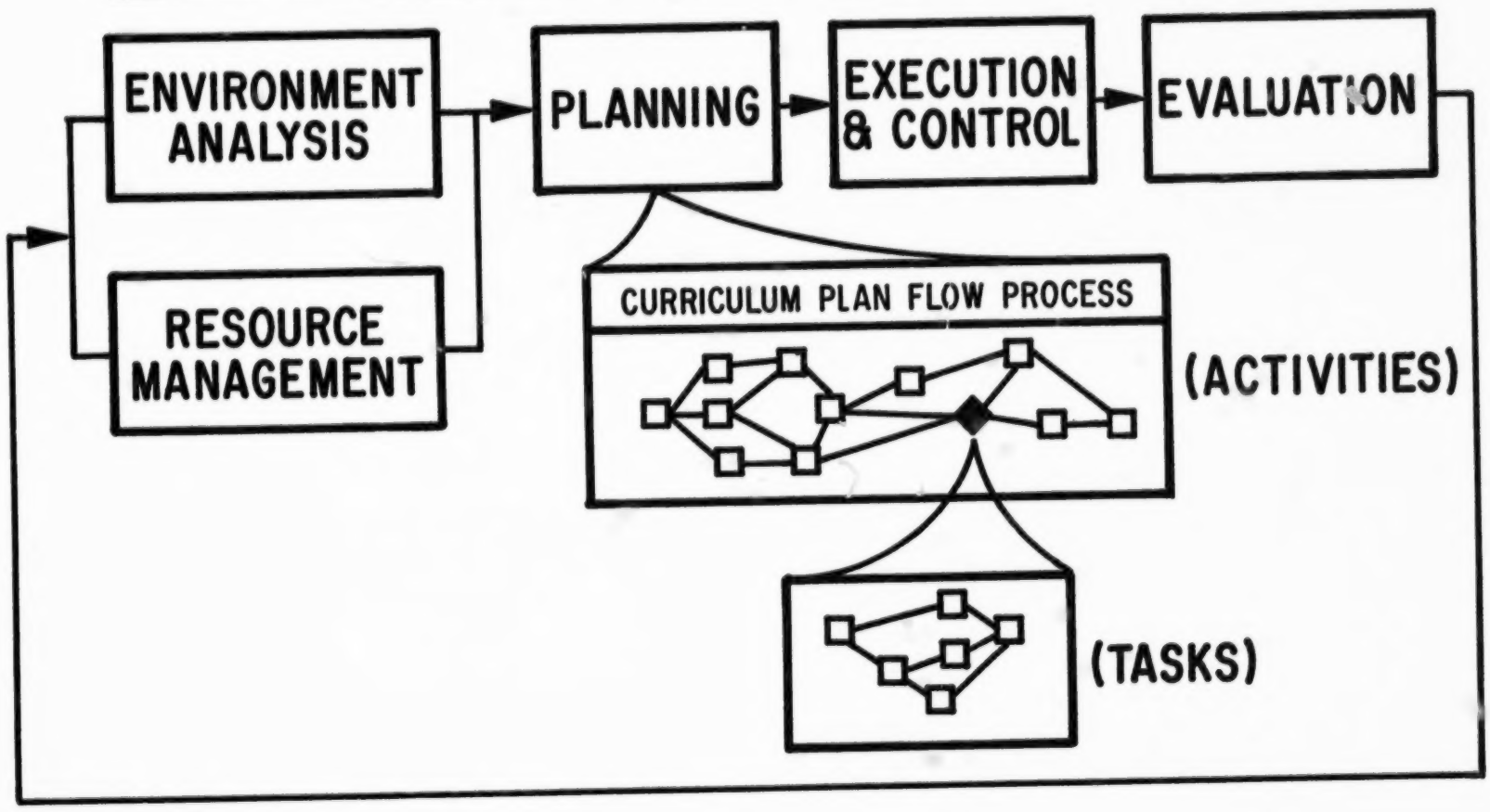
REQUIREMENTS ANALYSIS - STEP 5

PERFORM "FUNCTIONAL" ANALYSIS

- PROBE THE OPERATIONAL SYSTEM
- TRACE THE DEVELOPMENT OF MAJOR OUTPUTS
- INTERVIEW KEY AND COLLATERAL PERSONNEL
- DEVELOP PATTERN OF MAJOR DECISIONS / ACTIONS
- CORRELATE: OBJECTIVES, FUNCTIONS, ORGANIZATION, ACTIVITIES

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

EXAMPLE: MAJOR OUTPUT TRACING–A PLAN



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

REQUIREMENTS ANALYSIS - STEP 6

PROBLEM / SOLUTION HANDLING

- OPERATIONAL SYSTEM "PROBLEMS"
- INFORMATION SYSTEM "PROBLEMS"
- SYMPTOMS OF SICK SYSTEMS
- UNRAVELLING "PROBLEM - SOLUTION" SNARLS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

PROBLEMS

TASKS/ACTIVITIES

- TEDIOUS — DATA VERIFICATION, COMPUTATION
- ROUTINE — SIMPLE COMPUTER AIDS

} "QUICK-FIX"

- TIME CONSUMING — DATA COLLECTION, MANAGEMENT DISTRIBUTION, IR AIDS
- COMPLEX — DATA ANALYSIS, "WHAT-IF" SIMULATION AIDS

} LONGER RANGE

↓

IMPACT ON OPERATIONAL SYSTEM

HOW RELATED?

- BUSINESS/EDUCATIONAL OBJECTIVES
- INFORMATION SUBSYSTEM
- ACTIVITIES
- TASKS

"BRAINSTORM"

- CLARIFICATION
- RELATIONSHIPS
- INFORMATION VALUE

↓

SET PROBLEM PRIORITIES

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

TRANSLATION OF MAJOR PROBLEMS → **APPLICATIONS**

- SHORT RANGE PLANS AND CONCEPTS

CAN OBJECTIVES BE ACHIEVED?

EASIER?
FASTER?
AT LESS COST?
WITH FEWER DIFFERENT PEOPLE?

BY CHANGES IN

ORGANIZATION
RESPONSIBILITIES
PROCEDURES
LAYOUT

? EQUIPMENT

} "QUICK-FIX"/SHORT RANGE PLAN

AND BY REASSESSING WHAT KIND OF DATA ⟨ IS BEING COLLECTED ? / SHOULD BE COLLECTED ?

CAN EDP HELP?

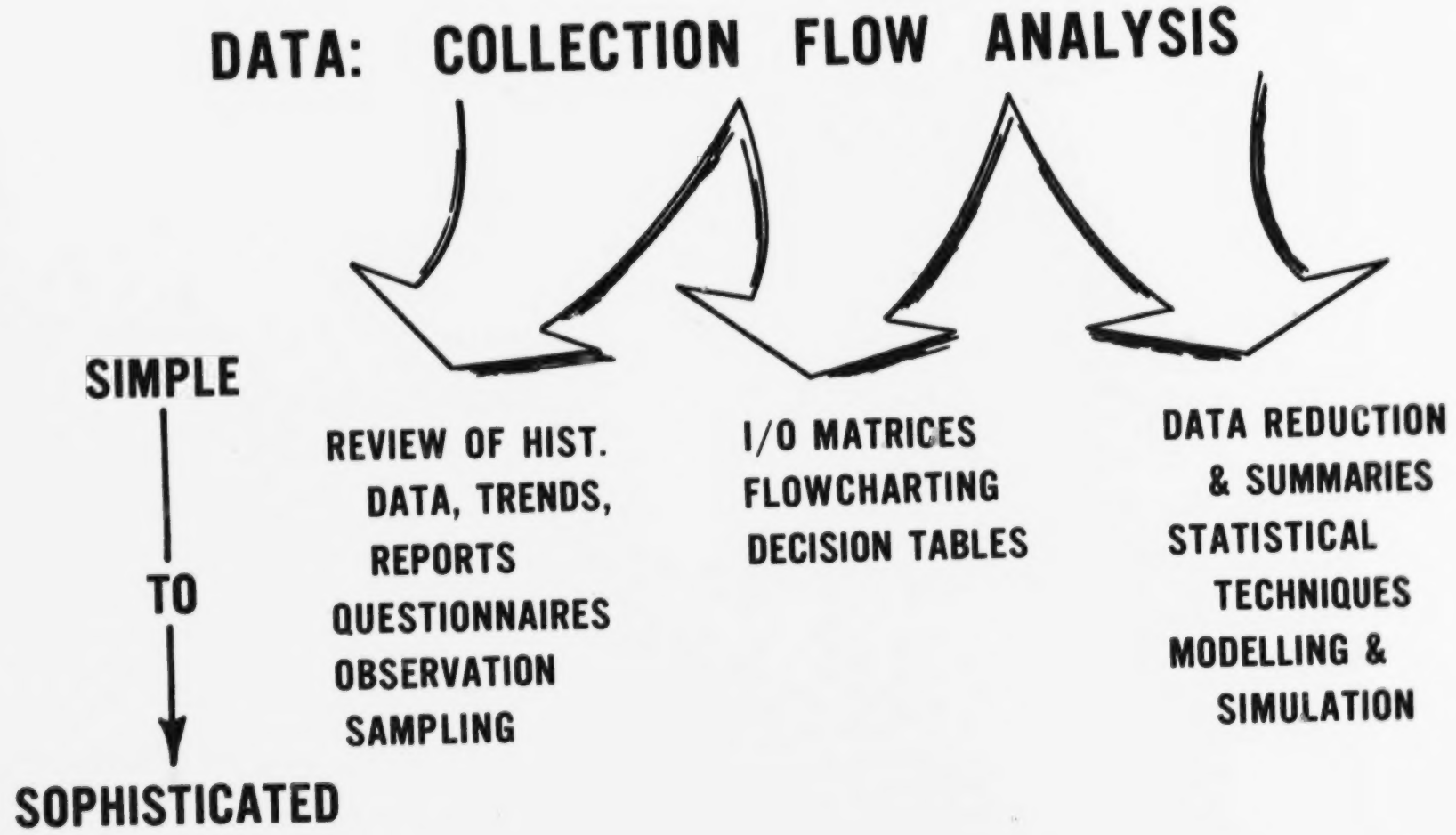
EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

REQUIREMENTS ANALYSIS - STEP 7

REITERATION WITH PROBLEM/SOLUTION FOCUS

- COLLECTION OF MORE DETAILED DATA
  - RELEVANT TO SELECTED PROBLEMS/SOLUTIONS
- SPECIFIC PROBLEM RANKING
  - STRESS IMPORTANT AREAS
- TOWARD EVOLUTIONARY IMPROVEMENTS

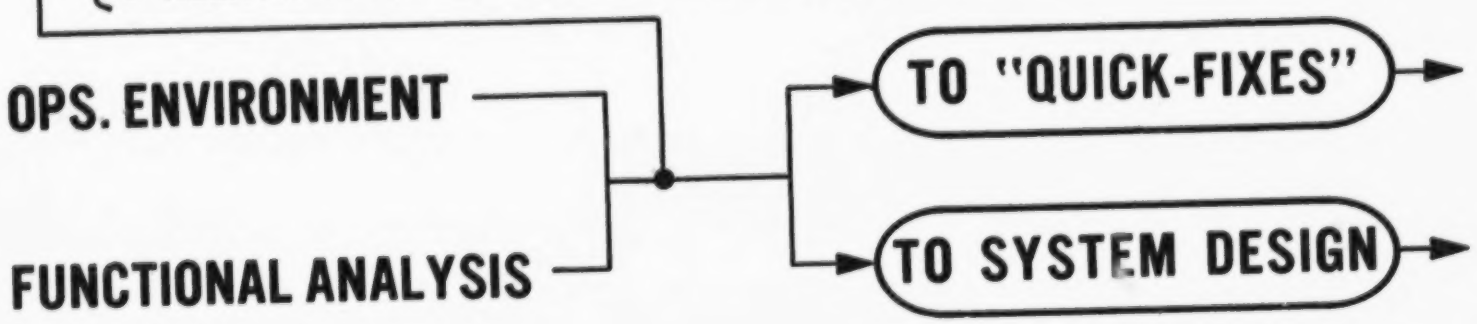
EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

RANKING OF PROBLEM AREAS/APPLICATIONS/ CONCEPTS

- IMPORTANCE IN RELATION TO ORGANIZATION/MISSION
- URGENCY IN RESPECT TO DISTRICT NEEDS
- AMENABILITY TO AUTOMATION AIDS
- EASE OF INTRODUCTION
  - POLITICAL, ECONOMIC & SKILL-CONSTRAINTS
  - TECHNOLOGICAL "SHOPPING LIST"
- "BUILDING BLOCKS" FOR FLEXIBLE GROWTH
- RELATIONSHIP TO STATE/OTHER SYSTEMS



REQUIREMENTS

ANALYSIS-SUMMARY

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

EIS ANALYSIS AND DESIGN PROCESS

NEEDS–RECOGNITION–CONTEXT

CONCEPTS–DE

PLANNING STUDIES

ANALYSIS TECHNIQUES

REQUIREMENTS ANALYSIS

SHORT RANGE PLANS

"QUICK-FIX" PROBLEMS / SOLUTIONS

INFORMATION HANDLING

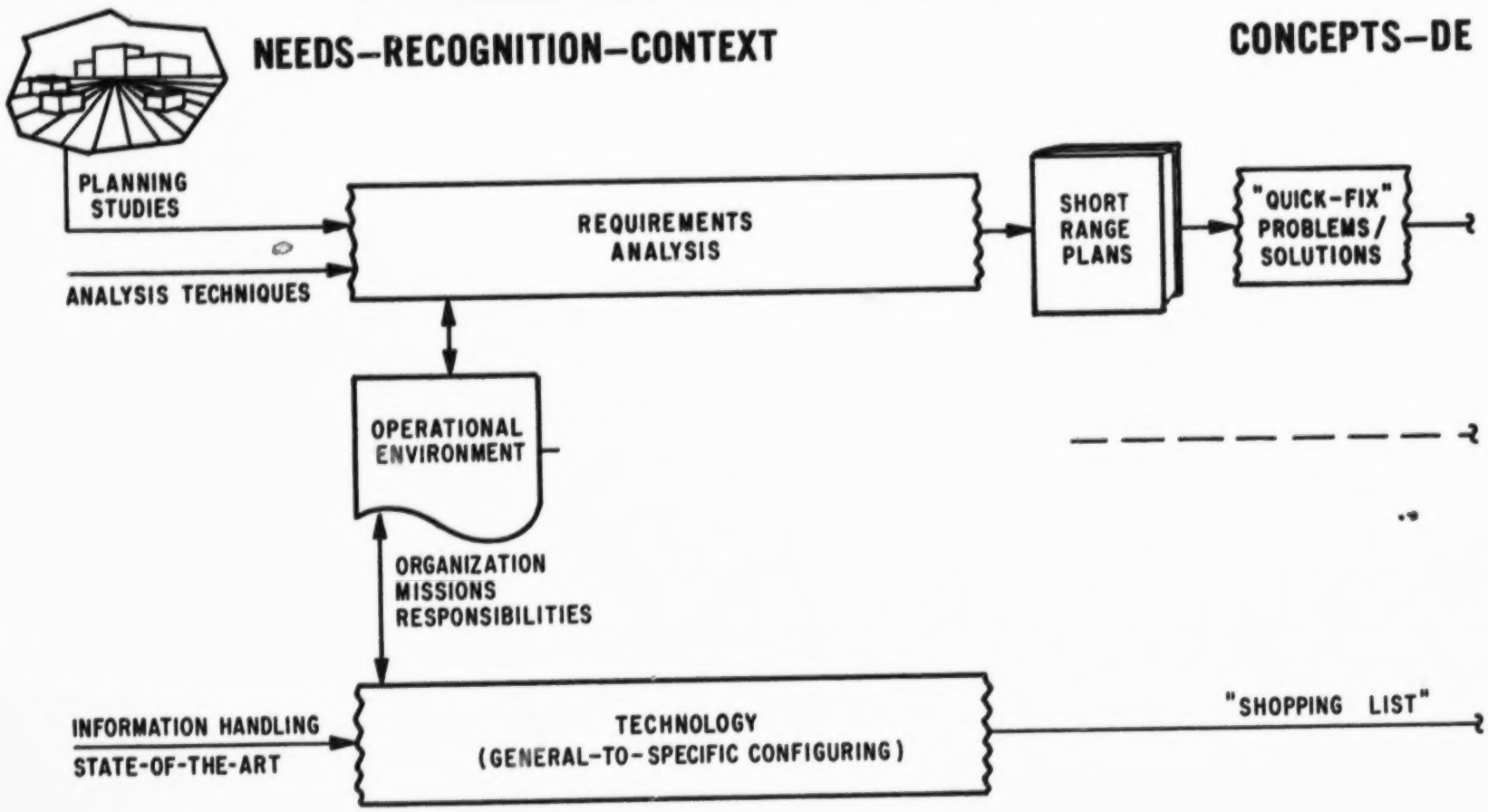
STATE-OF-THE-ART

TECHNOLOGY
(GENERAL-TO-SPECIFIC CONFIGURING)

"SHOPPING LIST"

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

EIS ANALYSIS AND DESIGN PROCESS



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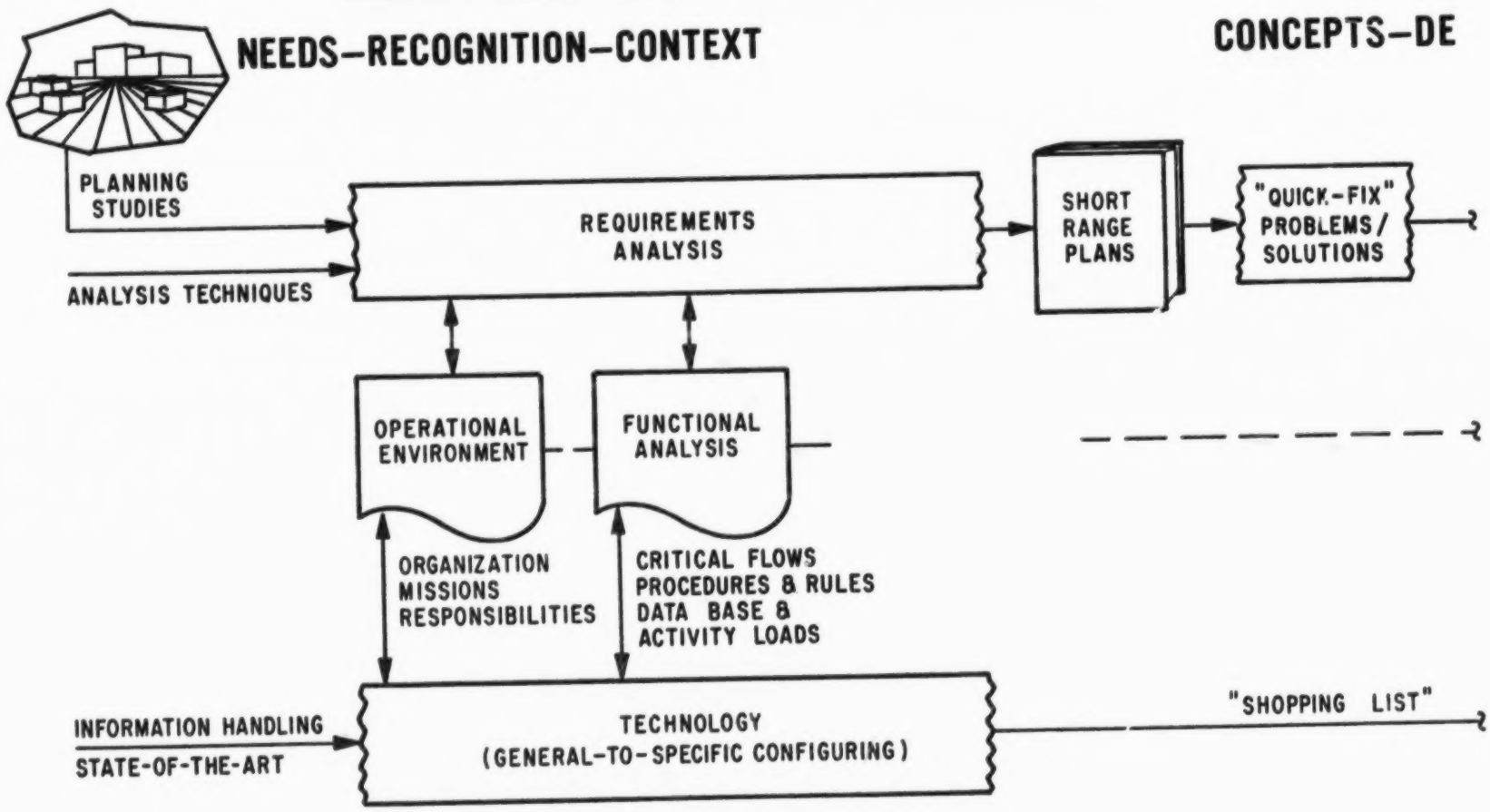
EIS ANALYSIS AND DESIGN PROCESS



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

EIS ANALYSIS AND DESIGN PROCESS

NEEDS–RECOGNITION–CONTEXT

CONCEPTS–DE

PLANNING STUDIES

ANALYSIS TECHNIQUES

REQUIREMENTS ANALYSIS

SHORT RANGE PLANS

"QUICK-FIX" PROBLEMS / SOLUTIONS

OPERATIONAL ENVIRONMENT

FUNCTIONAL ANALYSIS

SPECIFICATIONS PROBLEMS / APPLICATIONS CONCEPTS

ORGANIZATION
MISSIONS
RESPONSIBILITIES

CRITICAL FLOWS
PROCEDURES & RULES
DATA BASE & ACTIVITY LOADS

INFORMATION HANDLING
STATE-OF-THE-ART

TECHNOLOGY
(GENERAL-TO-SPECIFIC CONFIGURING)

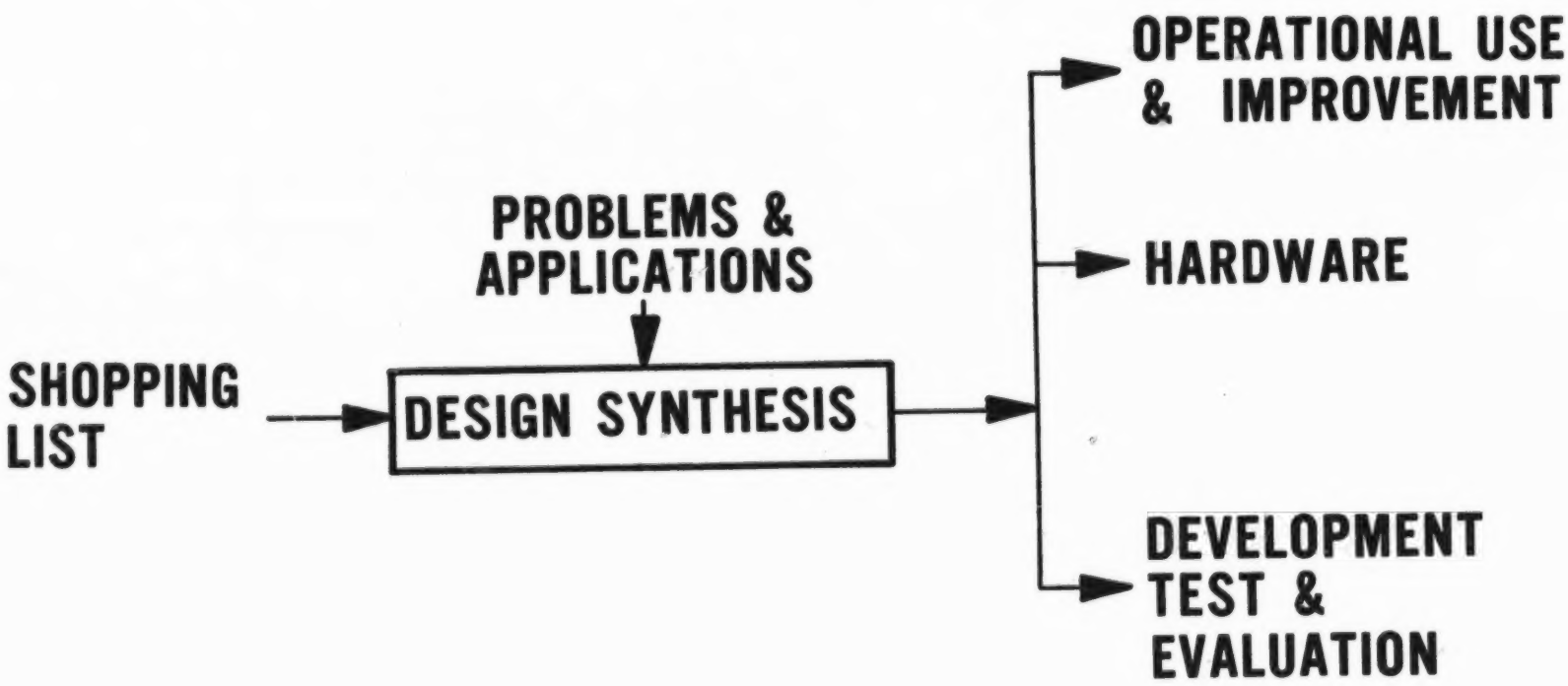
"SHOPPING LIST"

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

BASIC TYPES OF EFFORT

1. REQUIREMENTS ANALYSIS ✓✓
2. SYSTEM DESIGN & PLANNING ✓
3. DEVELOPMENT, TEST & EVALUATION
4. HARDWARE ACQUISITION
5. OPERATIONAL USE & IMPROVEMENT

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

SYSTEM DESIGN & PLANNING - STAGE 1

INCREASING NO. OF TECHNOLOGY OPTIONS (GROWING "SHOPPING LIST")

- HARDWARE
- SOFTWARE
- DATA MANAGEMENT
- OPERATIONAL MODES
- CENTRALIZATION/DECENTRALIZATION

> INFINITE NO. OF SYSTEM CONFIGURATIONS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

SYSTEM DESIGN & PLANNING - STAGE 1

IMPLICATIONS OF INCREASING OPTIONS

- SYSTEM DESIGN FLEXIBILITY

- ALLOWS DESIGN TO BE LESS "JOB-SENSITIVE"

- CONTROLLING FACTORS
  - -LESS: TECHNOLOGY
  - -MORE: OPERATIONAL FEASIBILITY

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

SYSTEM DESIGN & PLANNING - STAGE 1

IMPLICATIONS OF INCREASING OPTIONS

- THEY APPLY TO EVERYONE ELSE TOO
  - STATE
  - REGIONAL
  - SERVICE BUREAUS
- ECONOMIC FACTORS CHANGING RAPIDLY
- FEDERAL ROLE UNCERTAIN

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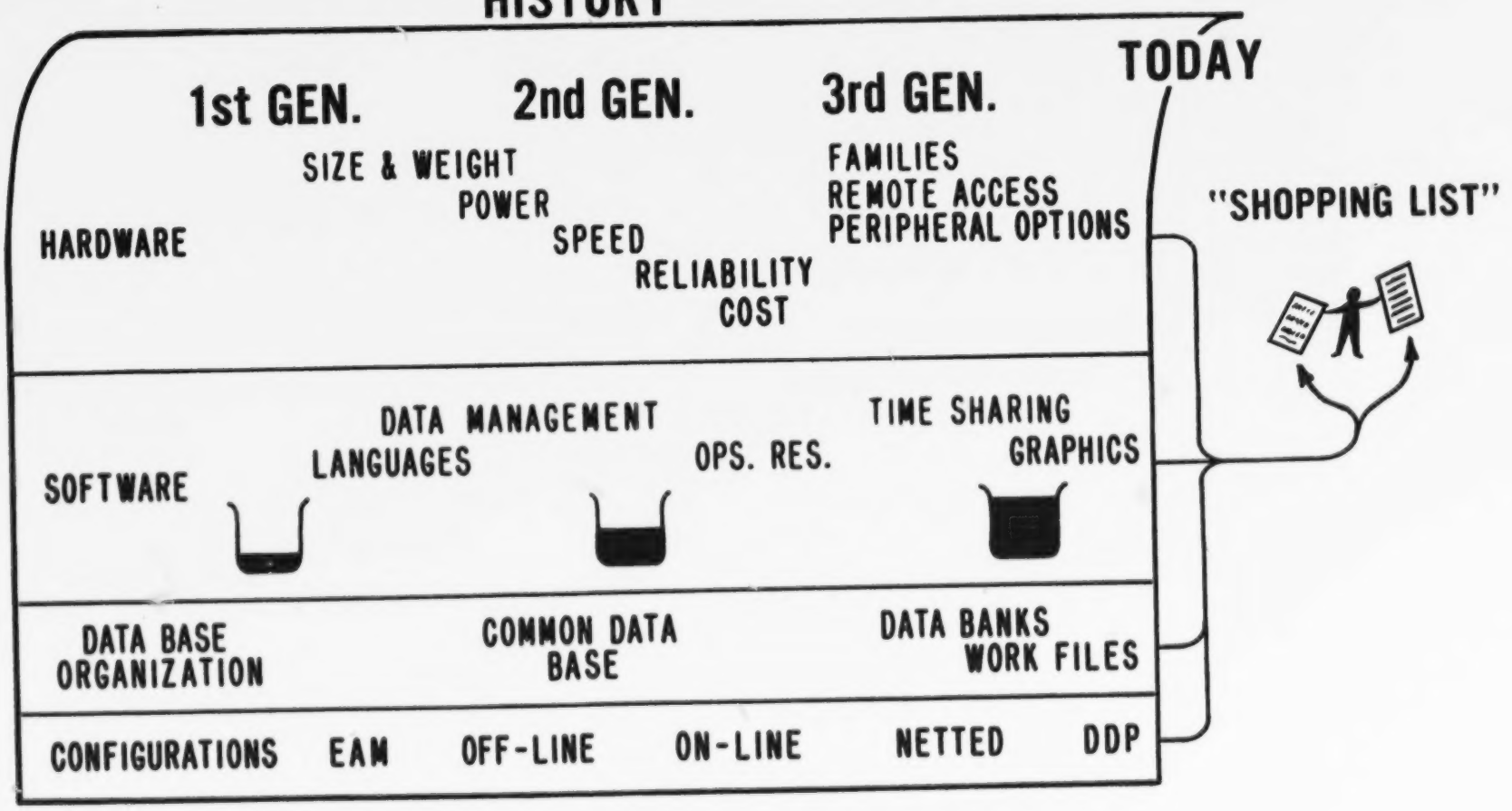
EIS OPTIONS

HISTORY



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SYSTEM DESIGN & PLANNING - STAGE 2

SYSTEM DESIGN/PLAN STRATEGY

- INFORMATION SYSTEM PROBLEMS & GOALS
- NEAR-TERM VS. LONG-RANGE
- FUNDS & SKILLS AVAILABLE
- LOCUS OF INITIATIVE
- IMPACTS OF BIAS

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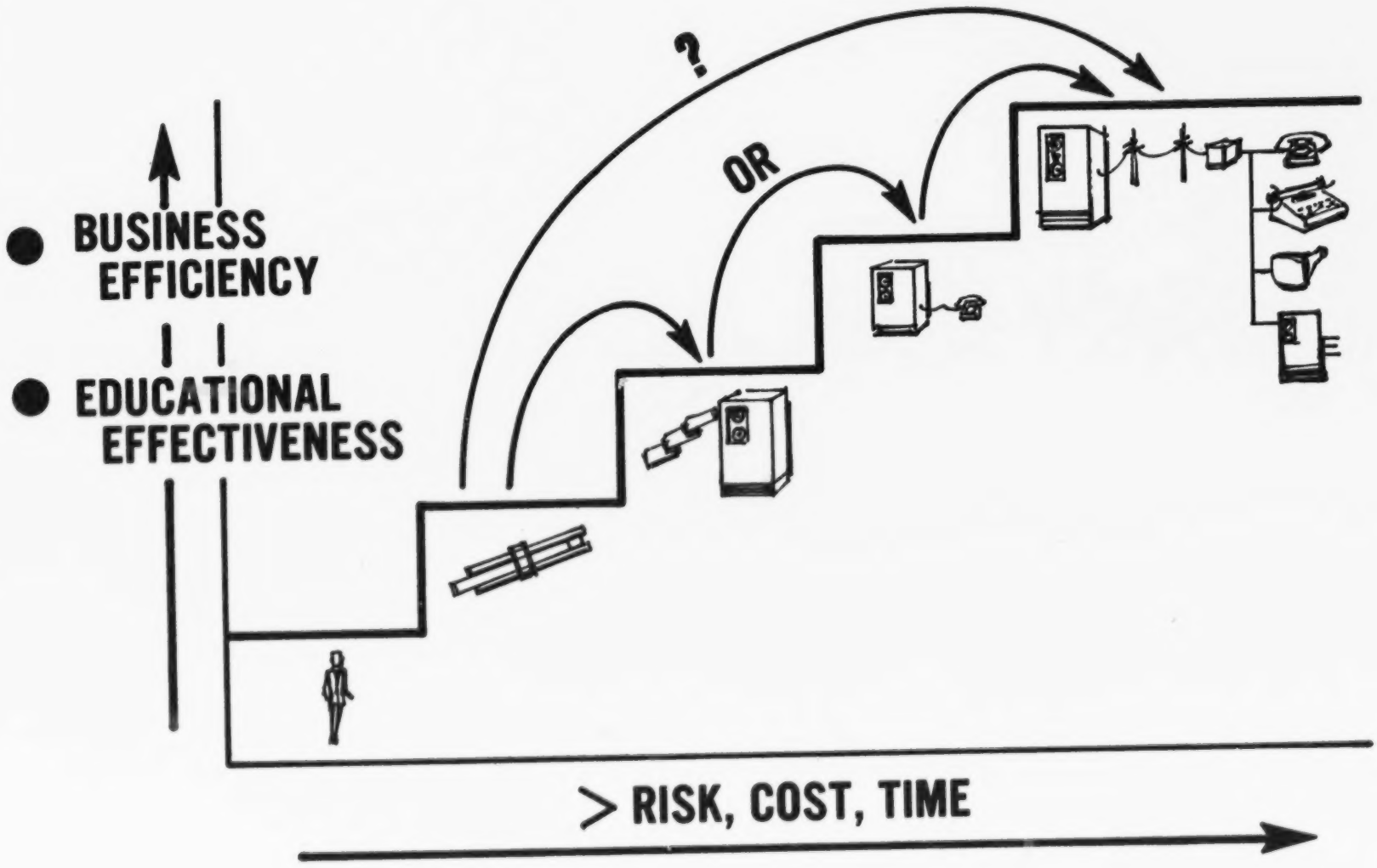
STRATEGY



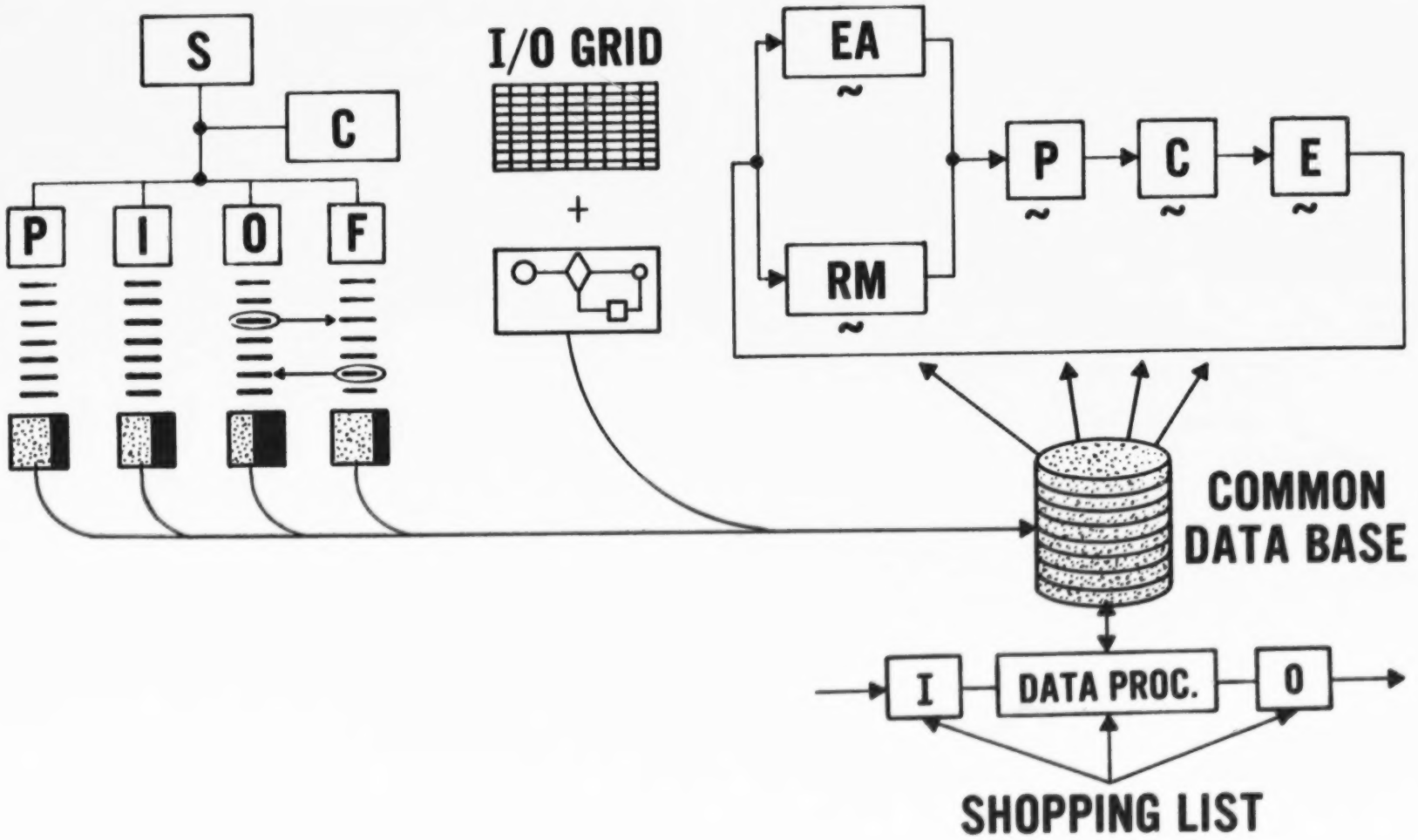
EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

SYSTEM DESIGN & PLANNING - STAGE 3

DESIGN SYNTHESIS

- SPECIFICATIONS FROM REQUIREMENTS ANALYSIS
- TECHNOLOGY OPTIONS
- STRATEGIC CONSIDERATIONS
- EVALUATION OF ALTERNATIVES

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT



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SYSTEM DESIGN & PLANNING - STAGE 4

DESIGN / PLANNING COORDINATION

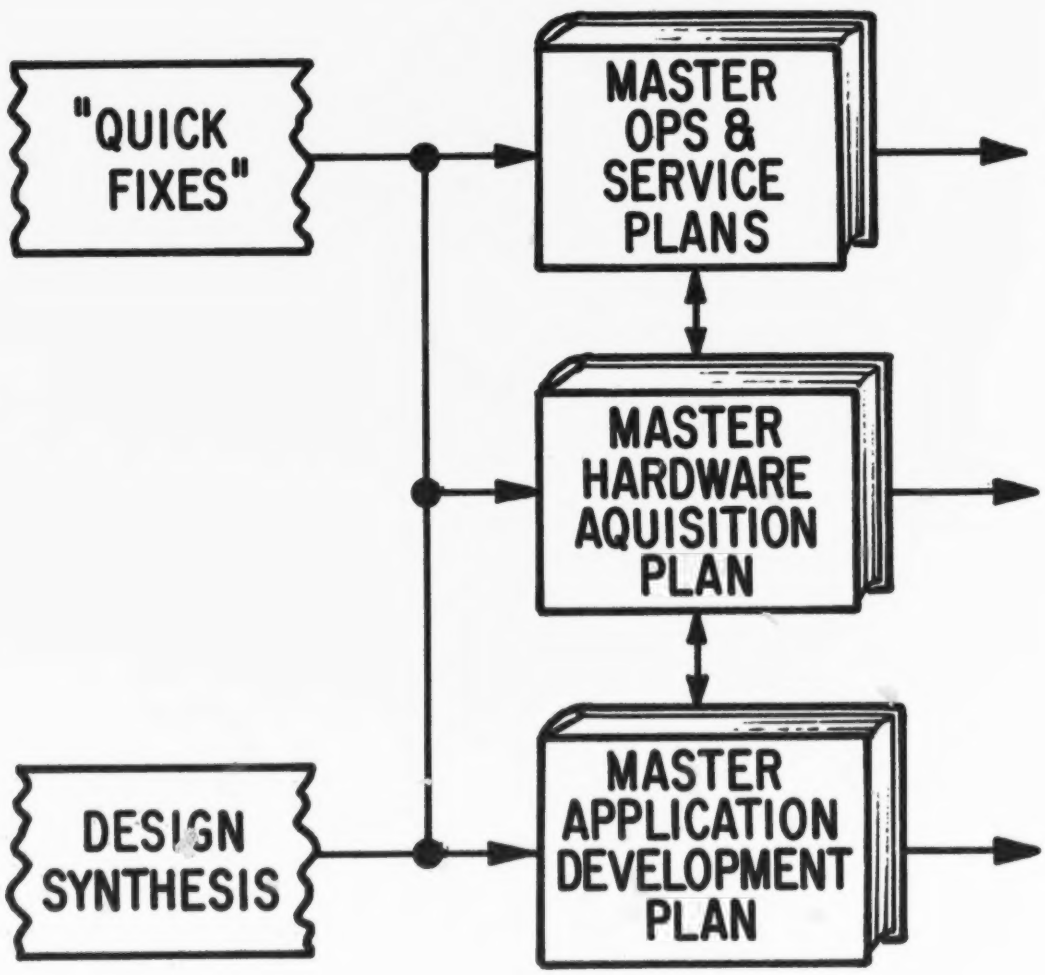
- DESIGN SYNTHESIS
- COORDINATE PLANS –

  APPLICATIONS DEVELOPMENT

  HARDWARE ACQUISITION

  OPERATIONAL USE & IMPROVEMENT

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

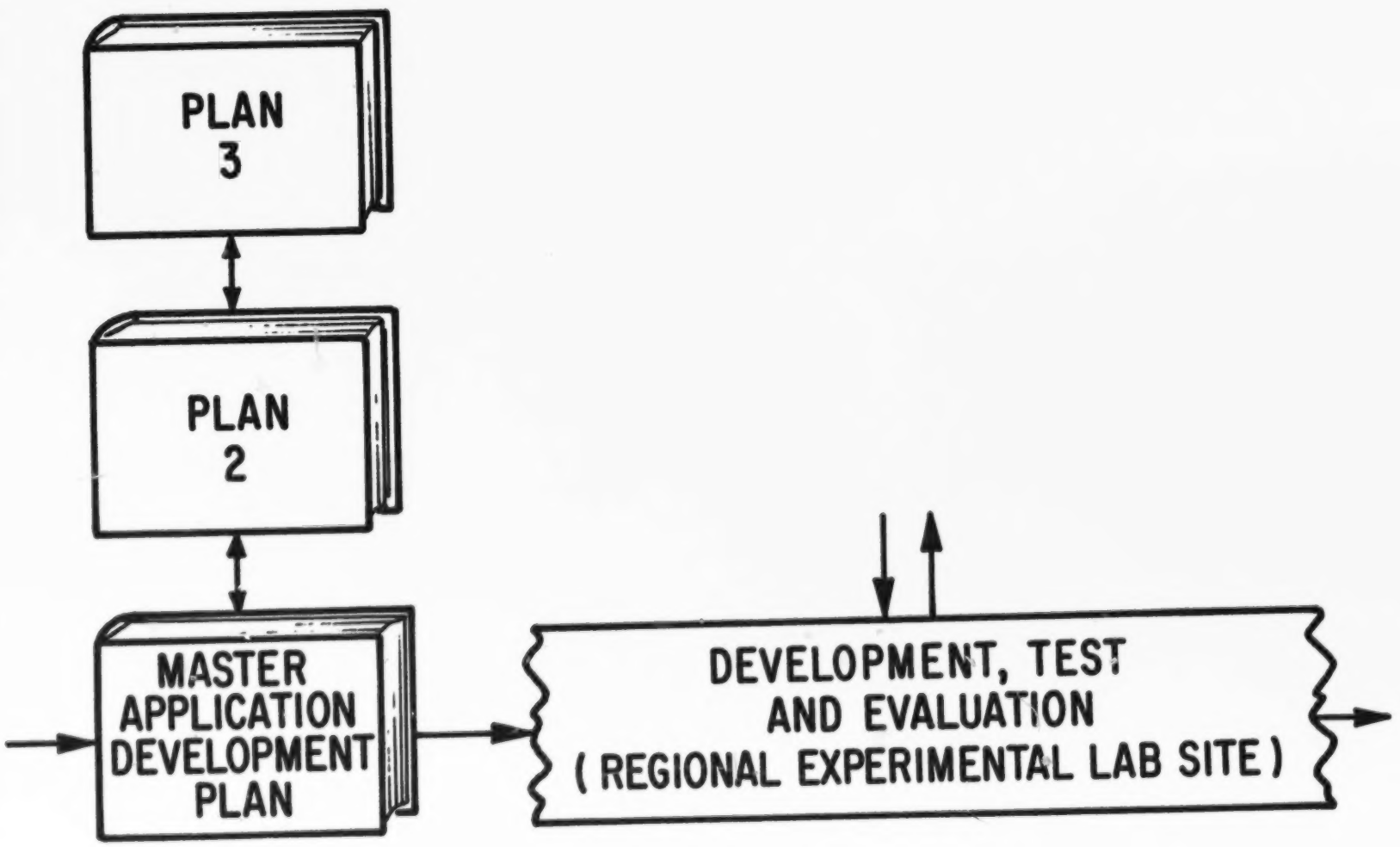


EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

3. APPLICATIONS DEVELOPMENT

- PACKAGE SIZE
- REGION LABS - STATE - DISTRICT - SCHOOLS
- (PROBLEM AREAS)

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT



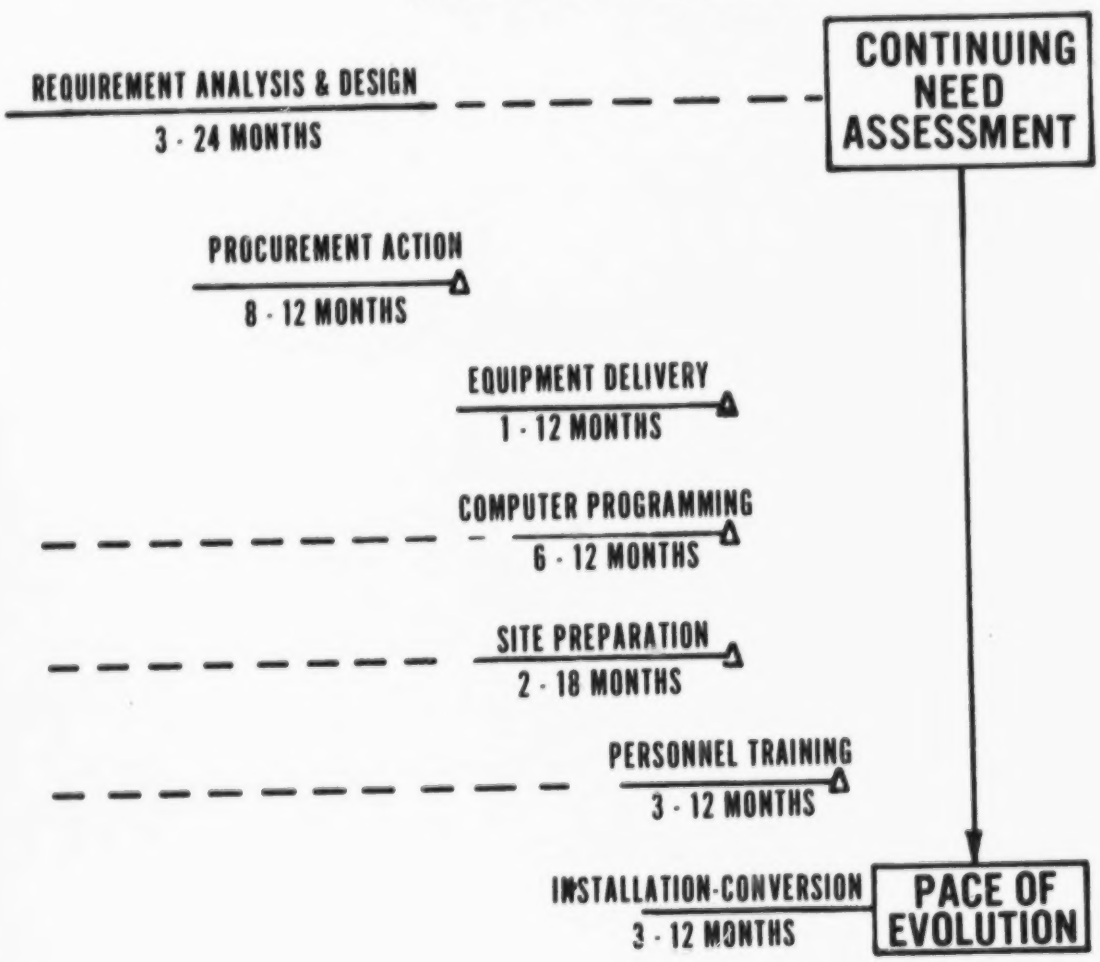
EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

4. HARDWARE ACQUISITION

- MAJOR STAGES
- TIME FACTORS
- PEOPLE FACTORS

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

MAJOR PLANNING MILESTONES



FACTORS AFFECTING

- DEGREE OF CONCURRENCY
- TIME/COST ESTIMATES
  - SCOPE
  - DEGREE OF COORDINATION
  - STABILITY OF REQUIREMENTS
  - QUALITY OF DOCUMENTATION
  - RESOURCES COMMITED
  - ACTUAL TIME AVAILABLE

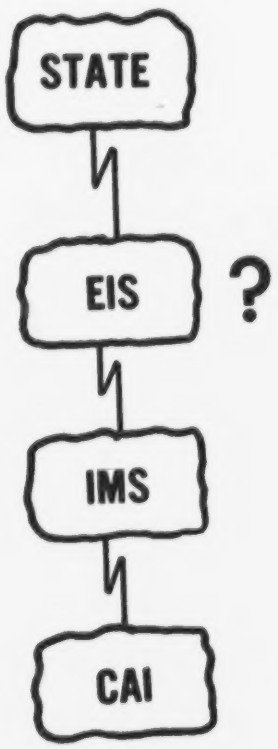
EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

5. OPERATIONAL USE & IMPROVEMENT

- PHASE-IN OF PLANNED IMPROVEMENTS
- PREPARING FOR FUTURE CHANGE & RENEWAL

EXECUTIVE INFORMATION SYSTEMS

A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT



"...DOUBTFUL THAT LARGE NUMBER OF SMALL, UNAFFILIATED OPERATORS CAN SURVIVE... CRITICALLY IMPORTANT TO EXPLORE POSSIBLE ARRANGEMENTS BY WHICH SMALL ORGANIZATION CAN ENJOY SOME BENEFITS OF LARGE-SCALE ORGANIZATION WITHOUT ANY SUBSTANTIAL LOSS OF AUTONOMY"

J.W. GARDNER
SELF-RENEWAL, 1964

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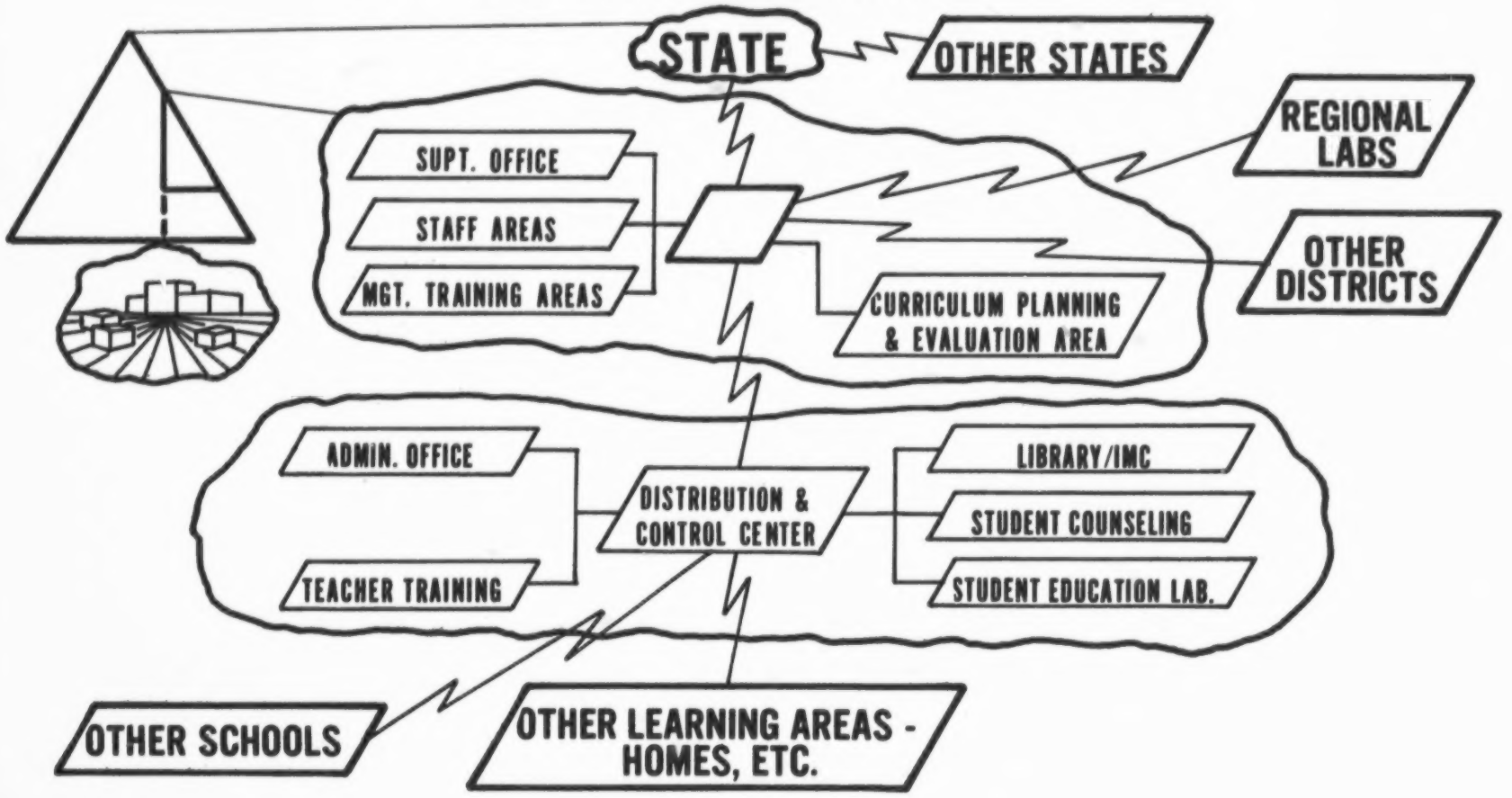
TOWARD EDUCATIONAL EFFECTIVENESS - FUTURE SYSTEM?



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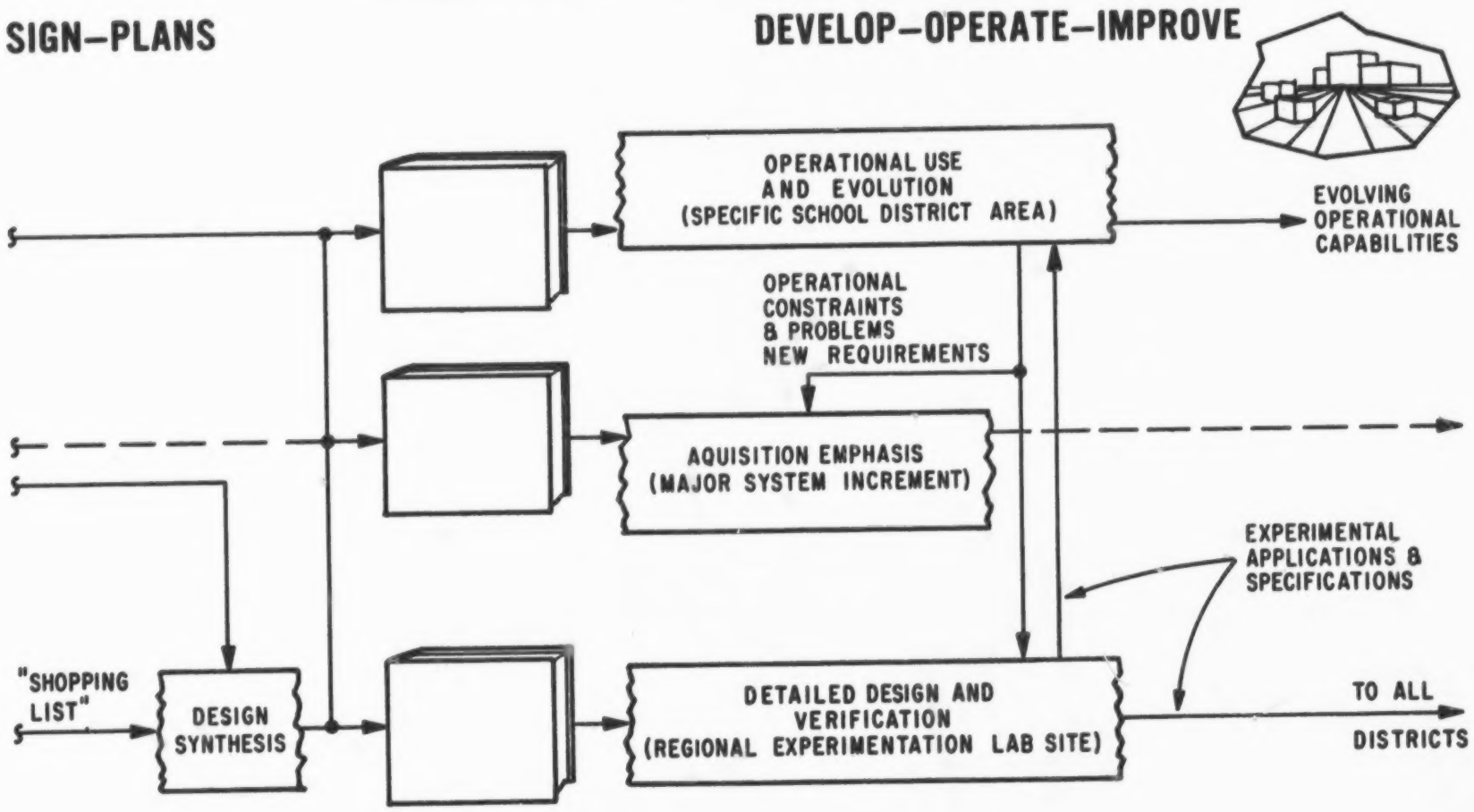
EIS ANALYSIS AND DESIGN PROCESS



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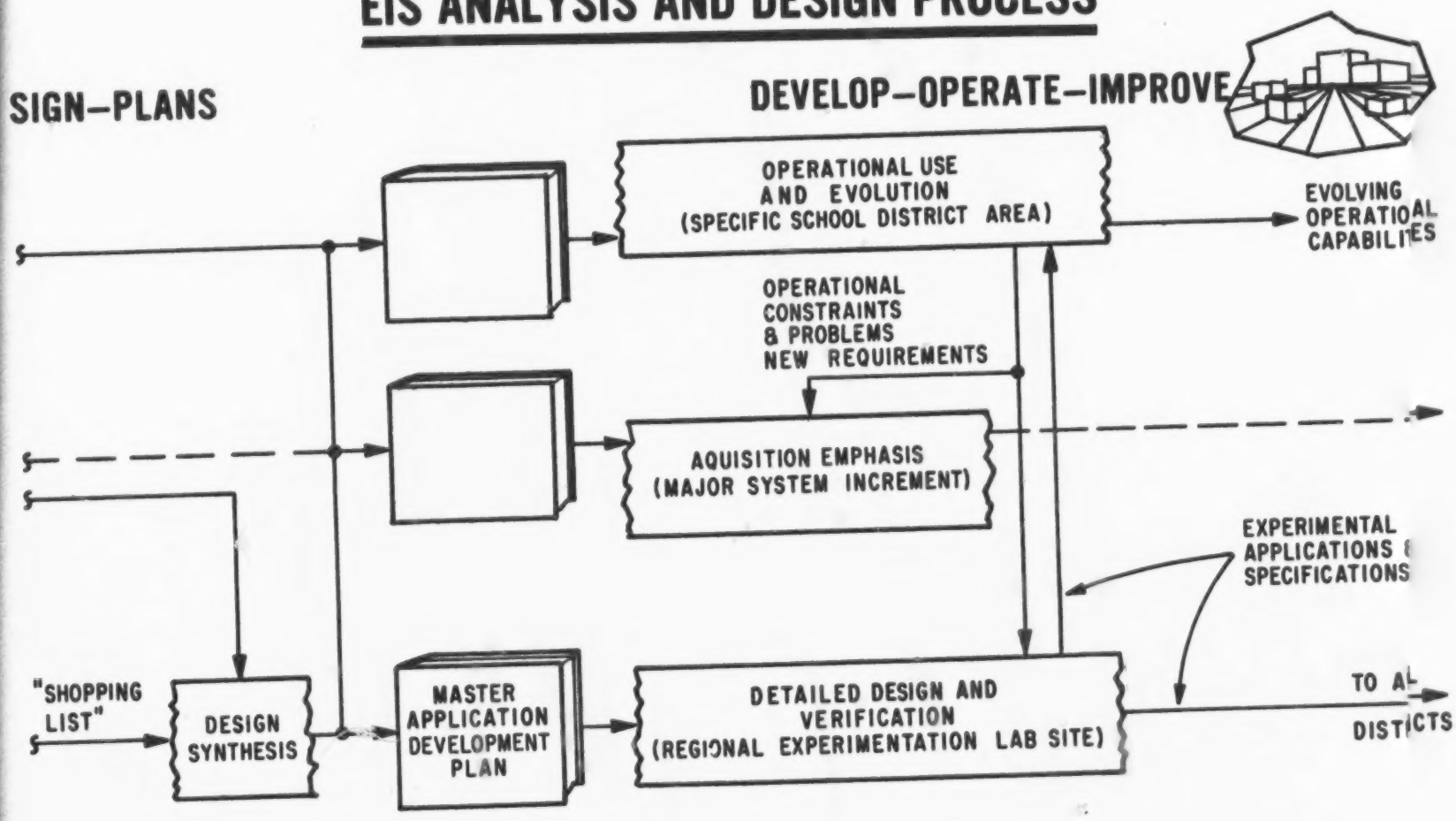

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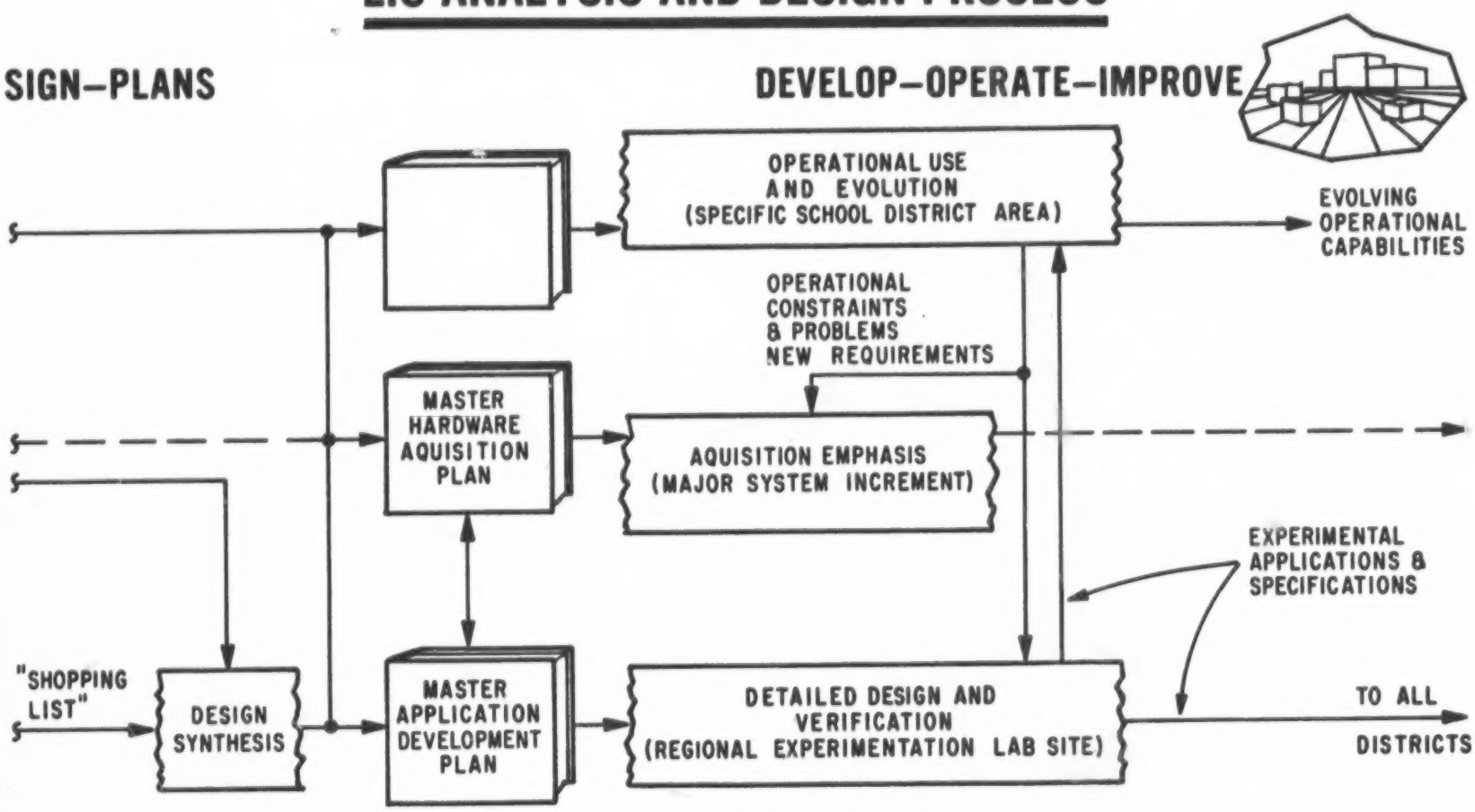
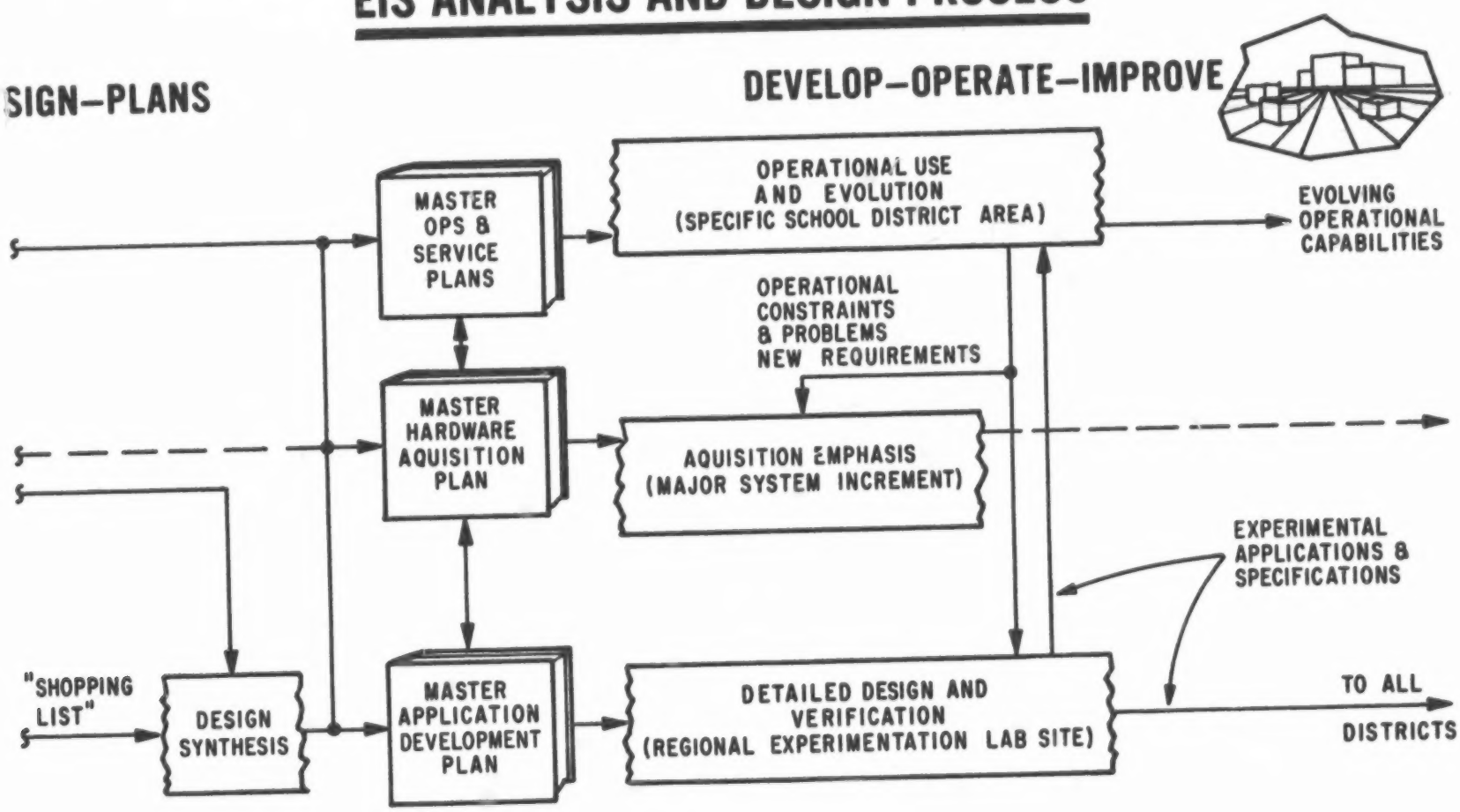
EIS ANALYSIS AND DESIGN PROCESS

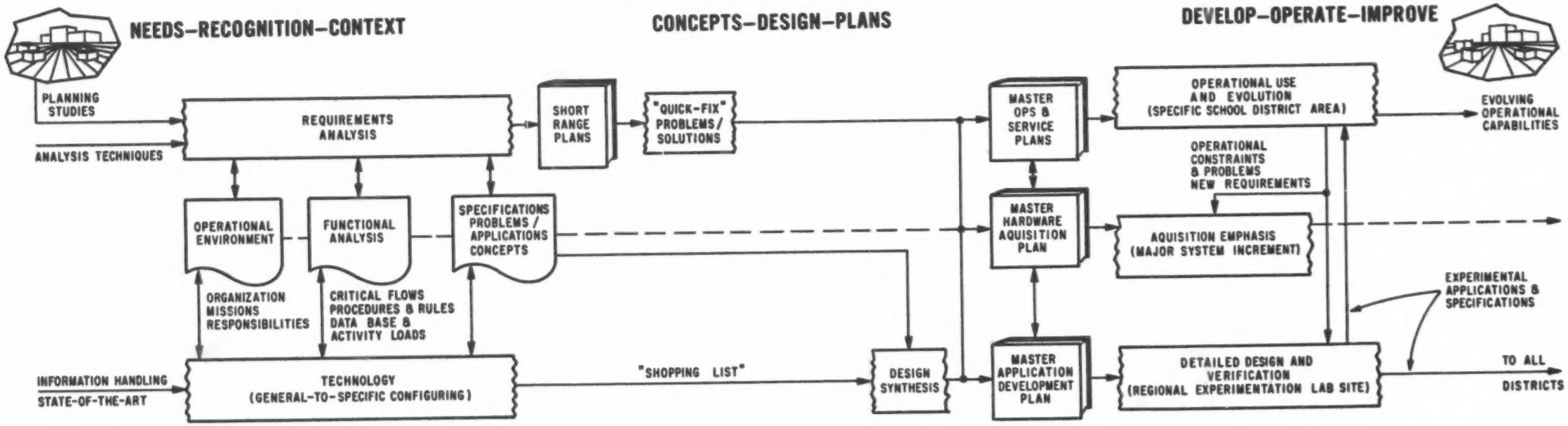


EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

EIS ANALYSIS AND DESIGN PROCESS


SIGN–PLANS
DEVELOP–OPERATE–IMPROVE
MASTER OPS & SERVICE PLANS
OPERATIONAL USE AND EVOLUTION (SPECIFIC SCHOOL DISTRICT AREA)
EVOLVING OPERATIONAL CAPABILITIES
OPERATIONAL CONSTRAINTS & PROBLEMS NEW REQUIREMENTS
MASTER HARDWARE AQUISITION PLAN
AQUISITION EMPHASIS (MAJOR SYSTEM INCREMENT)
EXPERIMENTAL APPLICATIONS & SPECIFICATIONS
"SHOPPING LIST"
DESIGN SYNTHESIS
MASTER APPLICATION DEVELOPMENT PLAN
DETAILED DESIGN AND VERIFICATION (REGIONAL EXPERIMENTATION LAB SITE)
TO ALL DISTRICTS

EIS ANALYSIS AND DESIGN PROCESS



EXECUTIVE INFORMATION SYSTEMS

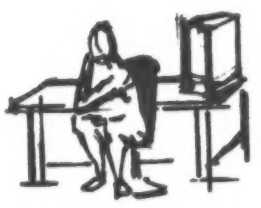
A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT

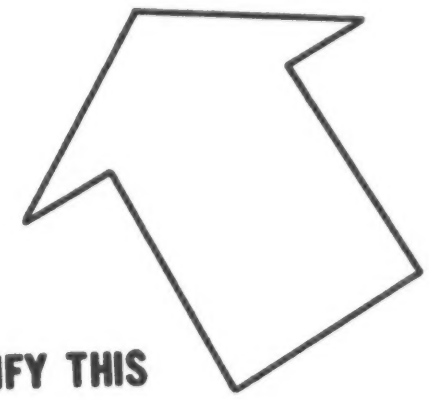
"WE HAVE MORE INFORMATION & LESS UNDERSTANDING THAN AT ANY TIME IN OUR HISTORY"

ROBERT HUTCHINS

TIME TO THINK ABOUT WHOLE MAN:
"THE HUMAN RACE LIVES - -
BY ART AND REASONINGS"

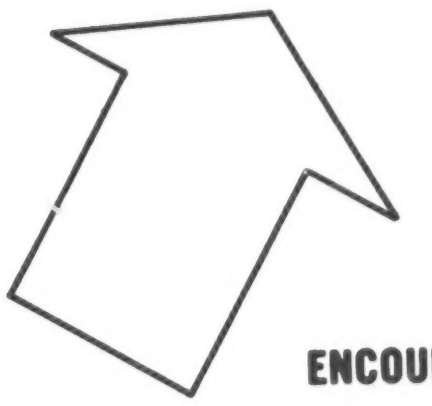
ARISTOTLE





INTENSIFY THIS

EIS



ENCOURAGE THIS